THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:-

1. A method of reducing mercury level in a mercury contaminated material comprising:

(a) placing the mercury contaminated material in a microwave reactor;

(b) providing a stream of gas in the microwave reactor, the stream causing agitation of the mercury contaminated material; and

(c) exposing the mercury contaminated material to microwave radiation so as to raise the temperature to at least 357°C, producing a vapour phase which contains mercury and a treated material.

2. A method of reducing mercury level in a mercury contaminated material comprising:

(a) placing a carbon-free material in a microwave reactor;

(b) placing the mercury contaminated material in the microwave reactor;

(c) providing a stream of gas in the microwave reactor, the stream causing agitation of the mercury contaminated material and the carbon-free material so as to form a mixture; and

(d) exposing the mercury contaminated material to microwave radiation so as to raise the temperature to at least 357°C, producing a vapour phase which contains mercury and a treated material.

3. A method of reducing mercury and carbon levels in a mercury contaminated material comprising:

(a) placing the mercury contaminated material in a microwave reactor;

(b) providing a stream of gas in the microwave reactor, the stream causing agitation of the mercury contaminated material; and

(c) exposing the mercury contaminated material to microwave radiation so as to raise the temperature to at least 600°C, producing a vapour phase which contains mercury and a treated material.

4. A method of reducing mercury and carbon levels in a mercury contaminated material comprising:

(a) placing a carbon-free material in a microwave reactor;

(b) placing the mercury contaminated material in the microwave reactor;

(c) providing a stream of gas in the microwave reactor, the stream causing agitation of the mercury contaminated material and the carbon-free material so as to form a mixture; and

(d) exposing the mercury contaminated material to microwave radiation so as to raise the temperature to at least 600°C, producing a vapour phase which contains mercury and a treated material.

5. The method according to claim 1 or 3 further comprising the steps of:

(a) removing the vapour phase from the reactor;

(b) terminating exposure of microwave radiation;

(c) removing the treated material from the reactor; and

(d) introducing fresh mercury contaminated material in the reactor.

6. The method according to claim 2 or 4 further comprising the steps of:

(a) removing the vapour phase from the reactor;

(b) terminating exposure of microwave radiation;

(c) removing the treated material from the reactor;

(d) introducing fresh carbon-free material in the reactor; and

(d) introducing fresh mercury contaminated material in the reactor.

7. The method according to claim 5, wherein steps (d) through (g) are continuous steps.

8. The method according to claim 6, wherein steps (e) through (i) are continuous steps.

9. The method according to claim 5 or 6 further comprising the step of introducing the vapour phase in a filtration device.

10. The method according to claim 9, wherein said filtration device is a cyclonic separator.

11. The method according to claim 5 or 6, further comprising the step of trapping the vapour phase containing mercury in a container.

12. The method according to any one of claims 1 to 4, wherein the microwave reactor is a fluidized bed reactor vessel.

13. The method according to claim 1 or 2, wherein the microwave radiation has a frequency between 300 MHz and 30 GHz.

14. The method according to claim 13, wherein said frequency is between 900 MHz and 3000 MHz.

15. The method according to claim 13, wherein said frequency is within the Industrial, Scientific and Medical (ISM) bands of approximately 915 MHz and 2450 MHz.

16. The method according to claim 3 or 4, wherein the microwave radiation has a frequency between 300 MHz and 30 GHz.

17. The method according to claim 16, wherein said frequency is between 900 MHz and 3000 MHz.

18. The method according to claim 16, wherein said frequency is within the Industrial, Scientific and Medical (ISM) bands of approximately 915 MHz and 2450 MHz.

19. The method according to claim 1 or 2, wherein a microwave radiation power level and process duration time which are sufficient to produce a specific energy of between 2 kW-h/t and 20 kW-h/t are used.

20. The method according to claim 19, wherein said microwave radiation power level and process duration is between 2 kW-h/t and 5 kW-h/t.

21. The method according to claim 3 or 4, wherein a microwave radiation power level and process duration time which are sufficient to produce a specific energy of between 4 kW-h/t and 20 kW-h/t are used.

22. The method according to claim 2 or 4, wherein a ratio of mercury contaminated material to carbon-free material of between 25/75 and 75/25 is used.

23. The method according to claim 22, wherein said ratio is about 50/50.

24. The method according to any one of claims 1 to 4, wherein said gas is selected from ambient air and a gas inert with respect to mercury and carbon.

25. The method according to claim 24, wherein said gas inert with respect to mercury and carbon is selected from nitrogen and carbon dioxide.

26. The method according to claim 1 or 2, wherein said gas is inert with respect to mercury and carbon.

27. The method according to any one of claims 1 to 4, wherein the mercury level in the mercury contaminated material is up to 50% by weight.

28. The method according to claim 3 or 4, wherein the carbon level in mercury contaminated material is up to 60% by weight.

29. The method according to claim 2 or 4, wherein said carbon-free material is a microwave receptive material having a size distribution and density which are greater than that of the mercury contaminated material, and is selected from manganese dioxide, silica, metallic oxides, silicaceous oxides and mixtures thereof.

30. The method according to claim 29, wherein said carbon-free material is selected from manganese dioxide and silica.

31. The method according to any one of claims 1 to 4, wherein said treated material has a mercury contain of less than 10 ppb.

32. The method according to claim 31, wherein said mercury contain is less than 5 ppb.

33. An apparatus specially adapted to carry out the method according to any one of claims 1 to 4.